The Ohio Naturalist,

PUBLISHED BY

The Biological Club of the Ohio State University.

Volume VII. FEBRUARY, 1907. No. 4.

TABLE OF CONTENTS.

MORSE—The Columbus Esker..... 63
HERMS—Notes on a Sandusky Bay Shrimp, Palaemonetes exilipes Stimpson..... 73
SELBY—On the Occurrence of Phytophthora infestans Mont. and Plasmopora cubensis (B. & C.) Humph. in Ohio..... 79
STERKI—Some Notes on Collecting Mollusca in Ohio during 1906..... 86
FRANK—Meeting of the Biological Club..... 88

THE COLUMBUS ESKER.

WILLIAM CLIFFORD MORSE.

TERMINOLOGY.

The terms employed in this discussion have been used in various senses by different writers. Their application has been gradually restricted by a series of steps which the author will trace at the outset. Wright (1), in his chapter on kames, says: "The word 'kame' has already been defined as a local term applied to the sharp, gravel ridges which abound in various parts of Scotland, and which in Ireland are called 'eskers', and in Sweden 'osars'. As Geikie's work on 'The Great Ice Age' has given currency to the Scotch name, and as the word has been adopted by those who have investigated this class of formations most fully in America, it seems best to continue its use, though either of the names is more euphonious."

Wright's subsequent application of this term (kame) is to North American formations, which Geikie would have, at least in his third edition of "The Great Ice Age", (2) differentiated as osars and kames, if not by further distinctions. The former are defined by him as "ridges of gravel, etc., which coincide in direction with the trend of the glaciation—they follow, in short, the path of the ice sheet"; the latter as "Kames of gravel, sand, etc., which are typically developed in the Lowlands opposite the mouths of mountain-valleys, and which, when followed up such valleys, pass eventually into ordinary morainic accumulations." Not only does Geikie clearly distinguish between osar or esker on the one hand and kames on the other, but Chamberlin (3)

1. WRIGHT, G. FREDERICK. The Ice Age of North America, p. 297, 1891.
2. GEIKIE. Great Ice Age, Third ed., p. 205, 1894.
3. IBID, p. 745.

further emphasizes this distinction in his contribution (Glacial Phenomena of North America) to this volume. In defining these he says of osars or eskers: "These terms are restricted to the long, gravel ridges which conform, in general, to the direction of the ice-movement, and which are thought to represent the main drainage lines of the glaciers in their later stages, particularly when they approach a stagnant condition. The term kames, on the other hand, is applied to those gravel accumulations which take on the form of bunchy aggregations of knolls and irregular ridges, and have the tendency to arrange themselves in belts parallel to the margin of the ice. They frequently accompany terminal morains and have a quasi-morainic aspect."

In his thorough work on "The Glacial Gravels of Maine," under the head of "Sediments Transported by Glacial Streams," Stone (4) states that: "The simplest form is that of a cone, dome or hummock, and we find all transitions between these forms and the elongated, two sided ridges." "These gravel deposits have such curious and distinctive shapes that they have received local names wherever they occur. The Scandinavian osars, the Irish eskers (or eskars or eschars) and the Scottish kames are supposed to be the equivalents of the gravel ridges here described, or nearly related to them. These deposits contain matter of various sizes from fine clay to large bowlders, but gravel is by far the most abundant. I have found the term *glacial gravel* a convenient general title for describing every kind of coarse sedimentary formation which was deposited by glacial streams. The term has the disadvantage of implying a theory as to the origin of these sediments, and it does not describe their composition in all cases, yet it is often convenient as a generic name when there is doubt what specific name should be given to a certain deposit, whether kame, osar, etc." In chapter IV, "General Description of the Systems of Glacial Gravel," the term osar is exclusively used for these systems. These are described as comprising the sediments deposited by a single glacial river with its tributary and delta branches. Stone, in Chapter VI, quotes Chamberlin's distinction between the osar or esker on the one hand and kame on the other. He carries it a step further, however, and applies esker to the separate mounds and ridges of a series of separated deposits known as a discontinuous osar.

In his exhaustive works, "The Illinois Glacial Lobe" (5) and "Glacial Formations and Drainage Features of the Erie and Ohio Basins," (6) Leverett uses exclusively the term esker for these gravel ridges whose longitudinal axes correspond to the local axis of the ice sheet. Whether intentionally or otherwise this

4. Monograph XXXIV. U. S. G. S. p. 34.
5. Monograph XXXVIII. U. S. G. S., 1899.
6. Monograph XLI. U. S. G. S., 1902.

application conforms to the restriction placed upon the term by Stone, for these gravel ridges are, as a whole, both short and interrupted.

Chamberlin and Salisbury ([7]) in their recent work, use osar or esker and kame in the same sense that Chamberlin used them in "The Great Ice Age" mentioned above. The limits of the terms are perhaps a little more sharply drawn.

Thus we see that at the beginning in Sweden the term osar was applied to these gravel ridges. Ireland developed the term esker for them while in Scotland they were called kames. Later these terms were used interchangably for these formations in other parts of the world. Still later Geikie in Scotland and Chamberlin in America restricted the term kame to those gravel bunches and ridges which stood in more or less close relation to the terminal moraines and applied osar or esker to the others, *i. e.*, those parallel with the flow of the ice tongue. More recently Stone limits esker to short interrupted osar while esker alone is employed by Leverett in his works. Because of these well defined usages, osar or esker on the one hand and kames on the other should not now be used interchangeably. It would, perhaps, have been better also to have differentiated between osar and esker as used by Stone, in the second best developed field in the world, but Geologists in subsequent papers have not accepted this latter distinction.

General on Eskers.

The place best fitted for the development of osars and eskers seems to have been a zone just within the periphery of the ice-sheet, at its maximum extension or at its subsequent stages of retreat. They may rest upon the bed rock or upon till stratified or unstratified. As before stated, they follow more or less closely the direction of the ice-flow as shown by the striae on the bed rock. They quite often follow the valleys of their region, but striking exceptions to this occur. Not infrequently they extend from a stream valley up and across a low divide of 200 feet (sometimes 400 feet) and down again into a valley on the other side. Instances are recorded where they cross a lake, their top not only sinking below the adjacent valleys, but below the surface of the water as well.

Parts of Europe and North America were especially well adapted for their formation. In Sweden they reached their culmination. Here they not infrequently extend for over a hundred miles from the interior to the sea. Their height varies from 0 to 180 feet but probably is more often found to be between 50 and 100 feet.

7. Geology, Vol. III. pp. 373-376 and 368-371, 1906.

As previously stated they are also to be found more or less abundantly in the Lowlands of Scotland and in Ireland. In the former country they usually rise abruptly from the till to a height of 20 to 30 feet and with a width of 100 to 400 feet. Those in the latter country are remarkable for frequently being dotted over with large erratics.

Turning to our own country we find their greatest development in Maine. In fact these are second to none unless it be to those of Sweden. Not only are they the greatest but more pages of minute description and more hypotehses to explain their formation have been written than of those in any other locality. Some fifty systems have been described by Stone. A few of these systems attain a length of 100 miles and some 125 miles. When we consider that each of these systems comprises the sediments deposited by a single glacial river with its tributary and delta branches and that they frequently consist of a number of short ridges we see the magnitude of their development.

Eskers are much less strikingly developed in other New England states, in New York, Pennsylvania, Ohio, Indiana, Illinois and Wisconsin. These are mostly short gravel ridges. Sometimes they can be seen to comprise a system.

For Ohio these have been worked out in some detail. Leverett has described, in Monograph XLI of the United States Geological Survey, eleven such gravel ridges as follows:

The Circleville Esker, Pickaway Co., pp. 429–431.
The esker in Fairfield Township, Huron Co., p. 597.
The Hartland Esker, Huron Co., pp. 615–617.
The Leesville Esker, Crawford Co., p. 542.
The esker near Norwalk, Huron Co., pp. 587–588.
The Pickerington Esker, Fairfield Co., pp. 428–429.
The Radnor Esker, Delaware-Marion Cos., pp. 540–541.
The Richland Esker, Logan Co., pp. 489–490.
The Richwood Esker, Union Co., p. 540.
The esker near Springboro, Warren Co., pp. 332–333.
The Taylor Creek Esker, Hardin Co., pp. 538–540.

All of these are 3 miles or less in length, except the Circleville and Pickerington eskers which are 9 and 5 miles respectively.

The Columbus Esker.

In the northeastern part of the city of Columbus is a ridge, the location of which has been known for a long time, but whose structure and composition were, probably, not recognised until last Spring, when it was the writer's good fortune to detect it. Workmen had excavated a ditch across its northern end for a water main, which exposed its alternate strata of sand and gravel to view. This gravel ridge probably ought to be described because of its convenient location, especailly to the Ohio State

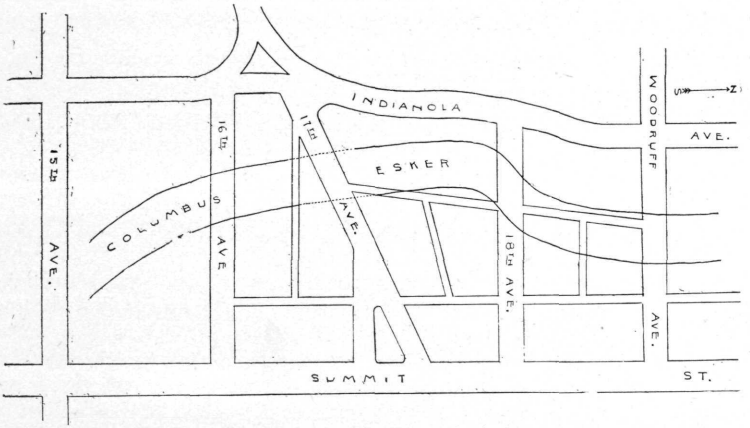

FIG. 1. Chart showing location of the Columbus Esker. The dotted portion shows where the ridge has been eroded by a small branch of Neil's Run, Seventeenth Avenue occupying the position of this branch.

FIG. 2. General view of the esker from a point near Seventeenth Avenue looking north. The shed is located upon the center of the ridge just north of Eighteenth Avenue, where there is a sharp turn to the east and thence northward.

University, and because of the rapid growth of this part of the city. The "leveling" hand of man will all too soon obliterate its distinctive features.

The trend of this esker is north to south between Summit Street on the east and Indianola Avenue on the west (Fig. 1).

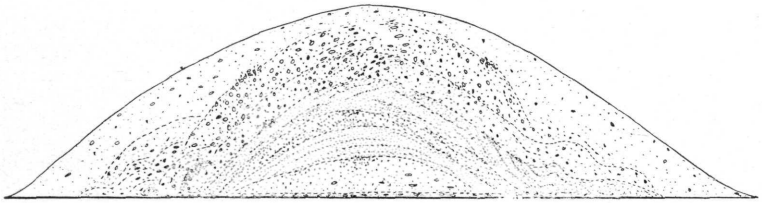

FIG. 3. A diagram of the cross section of the esker on the north side of Woodruff Avenue, width 128 feet, height 16 feet, 8 inches.

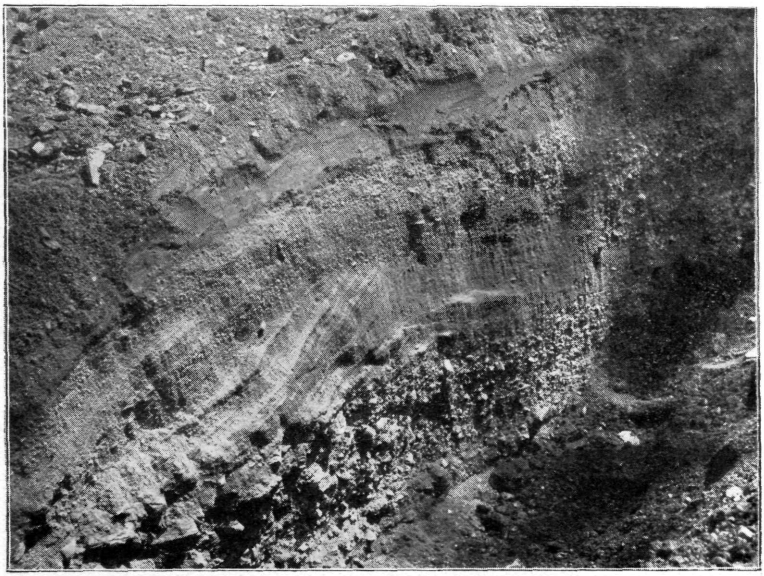

FIG. 4. A portion of the cross section of the esker on the north side of Woodruff Avenue. On account of the narrowness of the water-main ditch it was necessary to take the photograph at quite an angle.

It extends from the bank of Neil's Run 150 feet north of Woodruff Avenue south to Fifteenth Avenue. The residence of the Neil estate is located upon its southern end. A portion of the

ridge has been eroded by a small branch of Neil's Run, which crosses it just north of Sixteenth Avenue.

A cross section (Figs. 3 and 4) at the northern end exposed by the excavation for Woodruff Avenue shows it to be 128 feet wide and 16 feet, 8 inches high. Here it rests directly upon the bed rock, the Ohio Shale. The bottom layer of 12 inches contains a great number of angular and partly water-worn pebbles of the adjacent shale (Fig. 4). The strata of the large central core dip outward from 20 ° to 45°. Here coarse and fine sand alternate with each other and with layers of coarse and fine gravel. On either side at the edges the stratification is somewhat tumbled or disturbed. This is probably due to the melting away of the ice at the sides and the subsequent settling of this portion. The strata contain a few rounded pebbles of the Ohio Shale and neighboring limestones, but the great majority are of foreign rock. The sheet of till here caps these crumpled portions and even runs over the entire form.

At Eighteenth Avenue the curbstone of the street does not reach the bed rock in the cut, but it was said to have been struck some 4 or 5 feet deeper. The height of the esker above the curb is 11 feet. As the ridge turns sharply to the southwest at this point the exact width was hard to determine, but it was taken to be 115 feet. The strata are deposited in a more uniform arch over the center with less distortion on the edges. Deeper excavation, however, might show the edges to be distorted. The strata consist of alternate coarse sand and fine gravel. The whole is capped by till.

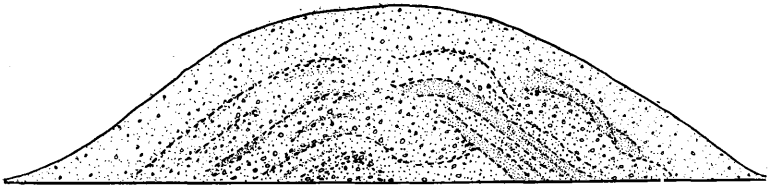

FIG. 5. A diagram to show the cross section on the north side of Sixteenth Avenue, width 114 feet, height (exposed) 13 feet, 5 inches.

The excavation for Sixteenth Avenue in the southern portion did not reach the bed rock (Figs. 5 and 6). Here it rises 13 feet, 5 inches above the cut and spreads out laterally to a width of 114 feet. The strata of the central portion are not laid down in such a uniform arch as those of the other two sections. Those of the eastern portion dipping at an angle of 45°. Fine and coarse sand and fine gravel alternate with each other. Water-worn pebbles of shale were found amongst those of foreign material. A few of those of the latter material attained the size of cobbles of 5 or 6 inches. Till covers the ridge as usual.

To the north and east of this ridge the plain is higher than to the west. Upon this higher ground the till is very thin if not almost entirely wanting. So sparse is it that it is hard to say where the till leaves off and the residual soil begins. Large bowlders or erratics, however, are sparsely strewn over the surface. Several large ones lie in Neil's Run immediately north of the ridge. One of these is about 6 by 8 feet. To the west and south the till, much of it stratified, increases very rapidly in thickness. The record of the State House Well shows it to be 123 feet (8), while another well drilled on the banks of the Olentangy River in the city limits passed through 104 feet of drift (9). Not only is the till much thicker but the large bowlders are much more numerous. These occur on the surface at frequent intervals and are smoothly worn.

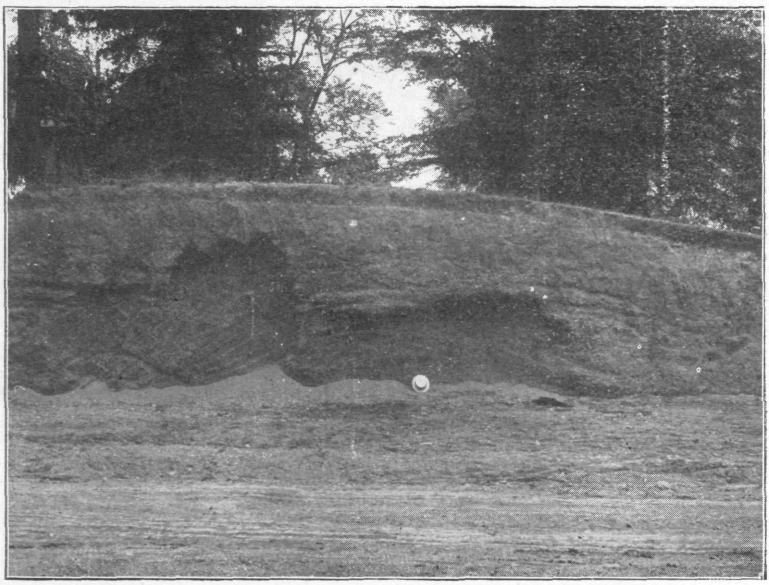

FIG. 6. A portion of the cross section on the south side of Sixteenth Avenue.

Other instances of water-deposited glacial material occur within the city limits. The excavation for the present Chemistry Building on the State University Grounds, directly west of this esker, showed deposits of the finer water-assorted material. These occur in alternate strata of coarser and finer drift in which

8. G. S. O. Vol. I. Part I. pp. 113–114.
9. Ibid, Vol. VI. p. 282.

were troughs of non-conformable cross bedding. The latter were probably the work of small rivulets. Frequent excavations for other buildings adjacent to High Street often show this deposit of water-assorted glacial material. This sometimes is of a much coarser nature, large cobbles and bowlderets often forming the greater amount of the deposit. In South Columbus on the bluffs of the Scioto just off High Street fine examples of stratified drift occur. These are located well up in the drift.

In this part of the city there is also a gentle swelling of the drift to form a ridge-like formation, which reaches its culmination in Baker's Hill, 819 feet above tide. South of this other more or less distinct elevations occur until Spangler's Hill, 817 feet, is reached. Still further south a few indistinct knolls or short ridges occur. About opposite Duvall, in Pickaway County, a low ill-defined sand ridge gradually develops, which continues (at places almost wanting) for about a mile until the north end of the Circleville Esker is reached. This stands out some 40 or 50 feet above the surrounding country.

Are these level stratified deposits of the various parts of Columbus sand plain or alluvial fan deposits of the above glacial stream? Or are the knolls, short ridges and gravel hills, which lie between this Columbus Esker and the Circleville Esker, interrupted deposits of this glacial stream? Or is the Columbus Esker simply one of those short gravel ridges which cannot be definitely connected with a delta deposit or another esker system? Further field work and study alone can solve this, if a solution is possible, and this the writer hopes to be able to accomplish.

Practically ever since the abandonment of the ice-berg theory and the introduction of the glacial hypothesis for the origin of the till, Geologists have attributed eskers to fluvio-glacial action. Some have held that they were accumulated in supra-glacial streams. Some have argued this method together with en-glacial stream deposition. More, however, have attributed them to sub-glacial streams, while still others have favored all three methods in varying degrees. Opposed to the supra-glacial and en-glacial origin Chamberlin and Salisbury say that: "(1) So far as known, the surfaces of ice-sheets are free from drift (apart from wind-blown dust) except for a fraction (and generally a small one) of a mile from their edges; and (2) superficial streams are, in general, much too swift to allow of the accumulation of drift in their channels." (10)

Geikie also found strong arguments against the superficial stream deposit and concluded by saying: "The tendency of superficial water-flow would be rather to distribute morainic material (material upon the ice) in irregular sheets over the surface

10. Geology, Vol. III. p. 376, 1906.

of the ice than to arrange it in determinate linear courses, unless, indeed, we are to suppose that the superficial rivers succeeded in rapidly cutting their way down to the bottom of the ice-sheet, and thus at an early period formed deep trenches into which was shot all the rock-rubbish derived from the ice during its dissolution. If it be hard to conceive such conditions possible, it is not easier to see how river beds filled with detritus to a depth of 50 to 60 feet, more or less, could retain their position and sink gradually down during the general ablation of the ice sheet." (11).

Let us consider the only way of superficial water origin of eskers conceivable to Geikie, viz.: "deep trenches," that is, streams whose banks were the ice-sheets and whose bottoms were the ground. These streams with the vast amount of water and material cast into them would be nothing short of torrents and would carry the material along and deposit it in approximately longitudinal, horizontal strata. Now take a case of an esker of Maine, which passes beneath the water of a lake, up the side of a valley, over a col or divide of 200 to 400 feet, and thence down the other side. Here the stream (deep trench) would continue to lay down its load in practically horizontal layers until the top of the divide was reached. The result would be not a long comparatively uniform ridge, as we find, but a ridge of perhaps only a few inches in height at the divide and 200–400 feet in height in the valley and with a still greater height across the lake basin. The fact that we have these ridges of practically uniform height extending through lakes, up valleys, across divides and down into other valleys seems to point to but one origin, namely: sub-glacial streams flowing under "head" at the maximum extent or at the various stages of retreat of the ice-sheet.

The writer is under obligation to Dr. George D. Hubbard for many suggestions and criticisms and for the photograph for figure 6 and wishes to express his thanks to him for the courtesies extended.

11. The Great Ice Age, 3rd Edition, p. 174.